PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: PIOTR STANISLAW BURYLO

913,281

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COMPLETE SPECIFICATION

Improvements in and relating to Stator Blade Adjusting Mechanism for Axial Flow Compressors

We, THE ENGLISH ELECTRIC COMPANY LIMITED, of Queen's House, 28 Kingsway, London, W.C. 2, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a mechanism for adjusting the stagger of a row of stator blades of an axial flow compressor or blower where it is essential that the operating mechanism is completely sealed.

In blowers or compressors having a variable duty it is often desirable to be able to adjust the stagger of the stator blades. It is particularly useful to be able to do so in the cases where the blower has to run at a constant speed when the adjustment then forms a means of controlling the mass flow. When the blower or compressor is running in contaminated, poisonous or radio-active gases an additional problem arises since it is essential that the operating mechanism be completely sealed.

According to the present invention in a stator blade adjusting mechanism, pivotally mounted stator blades of at least one stage of an axial flow compressor or blower, enclosed as a whole in a gas-tight vessel, are angularly adjusted in unison from outside that vessel by longitudinal movable control rods passing through gas-tight seals in said vessel. This arrangement allows the use of positive bellows seals which give a practically complete gas-tightness, and do not depend on any sliding glands. Preferably several seals are arranged in series to become effective one after the other in case of failure of the preceding seal, so as to ensure gas-tightness in any event, the innermost seal being the said bellows seal and the second seal being for example a packed gland. While these seals as far as possible allow unhampered movements of the control rods, the last seal may immobilise these rods for example by welding, brazing or soldering, in the optimum position of the pivotal stator blades.

In order that the invention may be clearly understood and readily carried into effect, an embodiment thereof will now be described with reference to the drawings accompanying the Provisional Specification, in which:—

Fig. 1 is a longitudinal section of the relevant part of a single stage axial flow compressor according to the invention.

Fig. 2 is a part end view of Fig. 1, and

Fig. 3 is a development of a circumference of a detail of Fig. 1, on a larger scale.

In the single stage compressor illustrated, there is a row of variable stagger stator blades 1, a row of rotating blades 2 and a row of fixed stator blades 3. The stator blades 1 extend between the inner and outer walls 4a and 4b of the compressor intake casing. The whole compressor is mounted within a gas-tight vessel, part of which is shown at 5. Each stator blade 1, is supported by bearings 6a, 6b in the inner and outer walls respectively.

Attached to the outer end of each stator blade spindle is a lever 7 pin-jointed to one end of a link 8 which at its other end is pin-jointed to the operating ring 9. With this arrangement axial movement of the ring 9 causes rotary movement of the stator blades 1 about their axes.

Control rods 10 sliding in bushes 11, 12 support the rings 9 and transmit the necessary longitudinal movement. Each rod extends through the outer casing at the compressor intake 13 and is attached to the yoke of a cross-head 14 which slides in keyways 28 in a mounting 15 attached to the compressor casing. The cross-heads are threaded internally and house the screws 16 which run in bearings 17 in the mounting 15. The

[*Price*

other end of the screw 16 carries a pinion 18 which meshes with a pinion 19 attached to an electric motor 20.

When the motors are energized, the screw 16 is rotated causing an axial movement of the cross head 14 and the control rods 10 and hence a change in stagger of the stator blades 1. In the design as shown in the drawing there are three control rods 10 each with its own motor 20 connected to the ring 9. These motors may be synchronised electrically so as to ensure even movement of all three rods. Obviously a mechanical method of synchronising might be employed equally well.

Where the control rod 10 passes through the casing 13 a seal is provided to prevent leakage of gas within the compressor to atmosphere. This comprises a bellows 21 welded or brazed at one end to a collar 22 on the shaft 10 and at the other end to a gland carrier 23 sealed to the casing 13. Thus the primary seal does not depend on any sliding glands.

To provide protection in case the bellows 21 should fail a secondary seal is provided in the form of a conventional packed gland 24. A series of small drillings 25*a*, *b*, *c*, connects the space between the bellows 21 and the gland 24 to an indicator (not shown) so that a warning is given in the event of failure of the primary seal 21.

If failure of the bellows 21 does occur then the gland 24 may act as a seal until the compressor can be taken out of service for repairs. Should this gland 24 in turn give trouble then provision is made for completely sealing the unit while losing the facility of varying the stagger of the blades. This may be done by two concentric sealing welds at the points indicated at 26 and 27. This operation completely seals and locks the control rods to the gland carriers. Obviously the blades would be set to their optimum operating position before welding.

The invention may be equally well applied to multi-stage compressors where more than one stages of stator blades are varied.

WHAT WE CLAIM IS:—

1. A stator blade adjusting mechanism for axial flow compressors or blowers having pivotally mounted stator blades in at least one stage, the compressor or blower being enclosed as a whole in a gas-tight vessel, comprising longitudinally movable control rods passing through gas-tight seals in said vessel whereby the said stator blades are angularly adjusted in unison from outside that vessel.

2. A mechanism according to Claim 1, wherein the said gas-tight seals are formed by bellows.

3. A mechanism according to Claim 1, wherein several seals are arranged in series to become effective one after the other in case of failure of the preceding seal.

4. A mechanism according to Claim 1, wherein the innermost seal is a bellows seal and a second seal is a packed gland.

5. A mechanism according to claim 3, wherein a leakage indicator is connected to the space between consecutive seals.

6. A mechanism according to Claim 1, wherein the said control rods are immobilised in the optimum position of the pivotal stator blades in case of leakage by a seal formed by welding, brazing or soldering.

7. A mechanism substantially as herein described with reference to the drawings accompanying the provisional Specification.

S. MITTLER,
Chartered Patent Agent.

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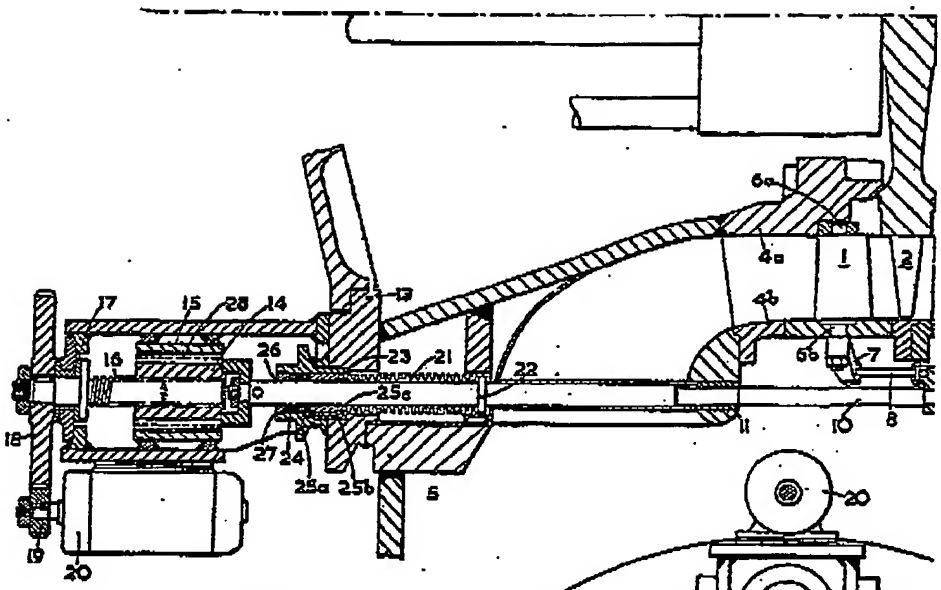
6a
4a
1
2
4b
17
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16
26
23
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11
10
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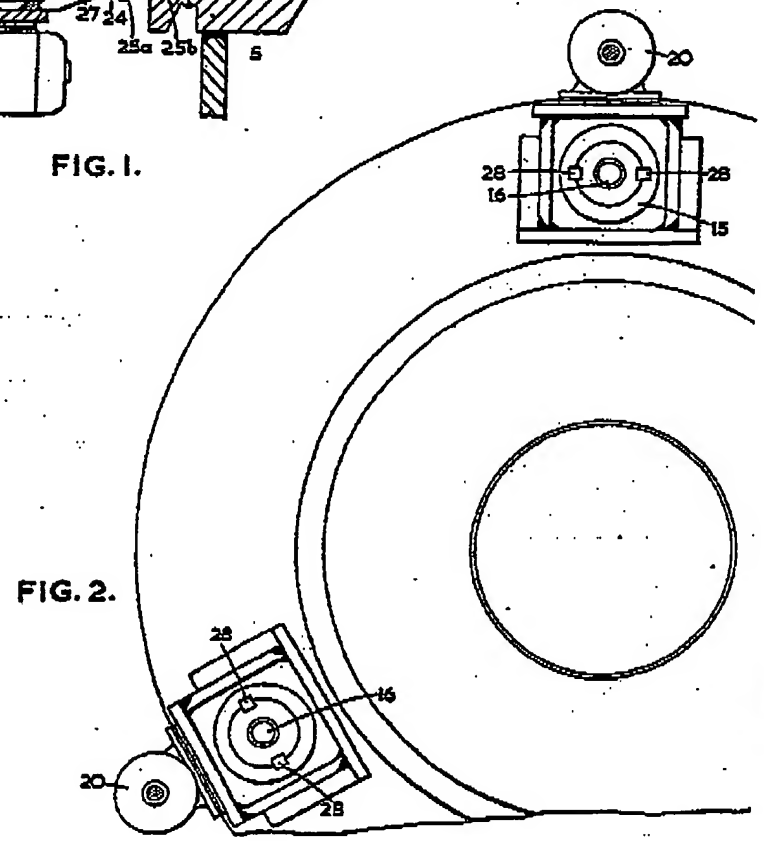
FIG. 1.


20
28
16
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16
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28

FIG. 2.

913281 PROVISIONAL SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

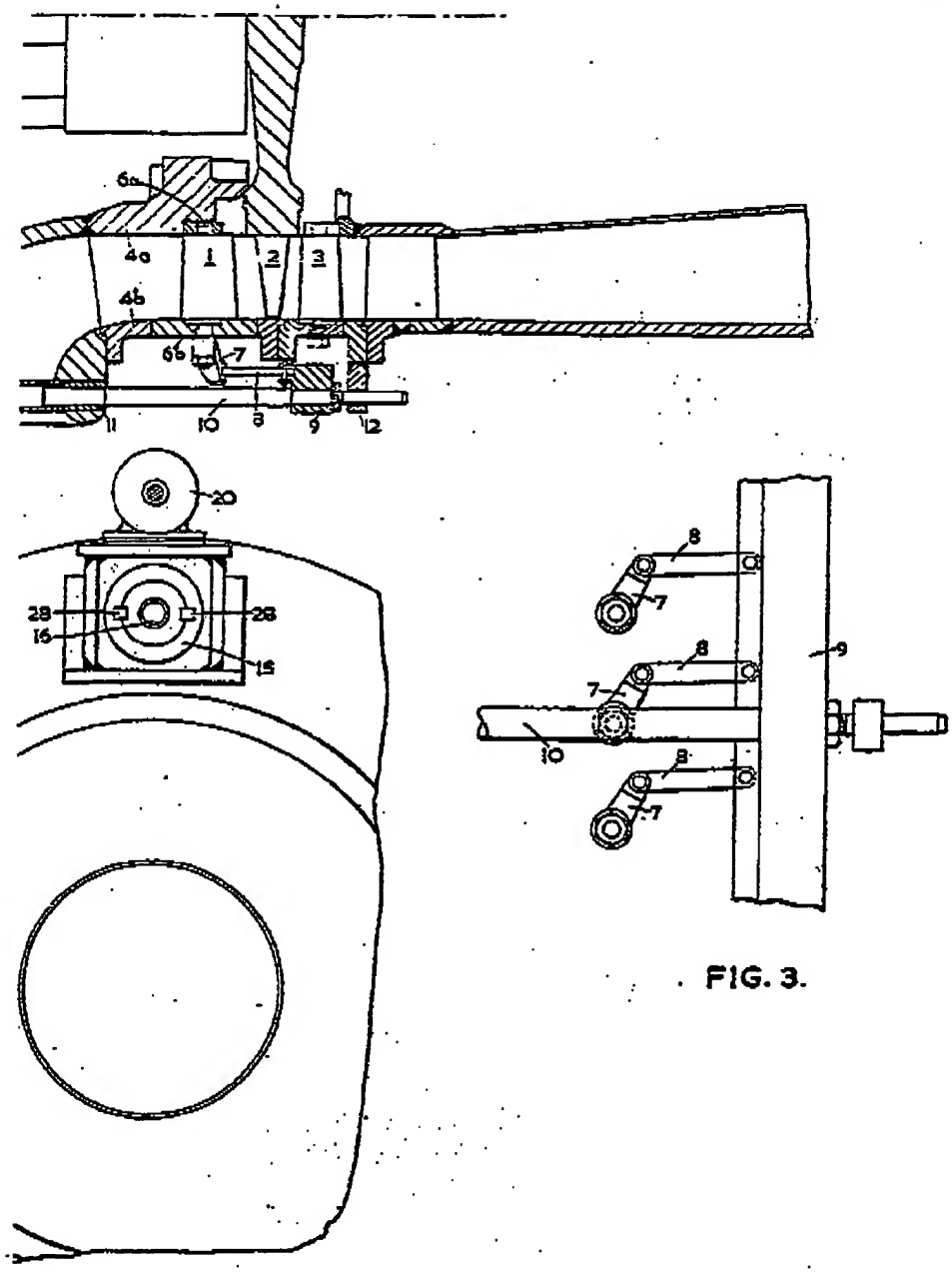

FIG. 3.

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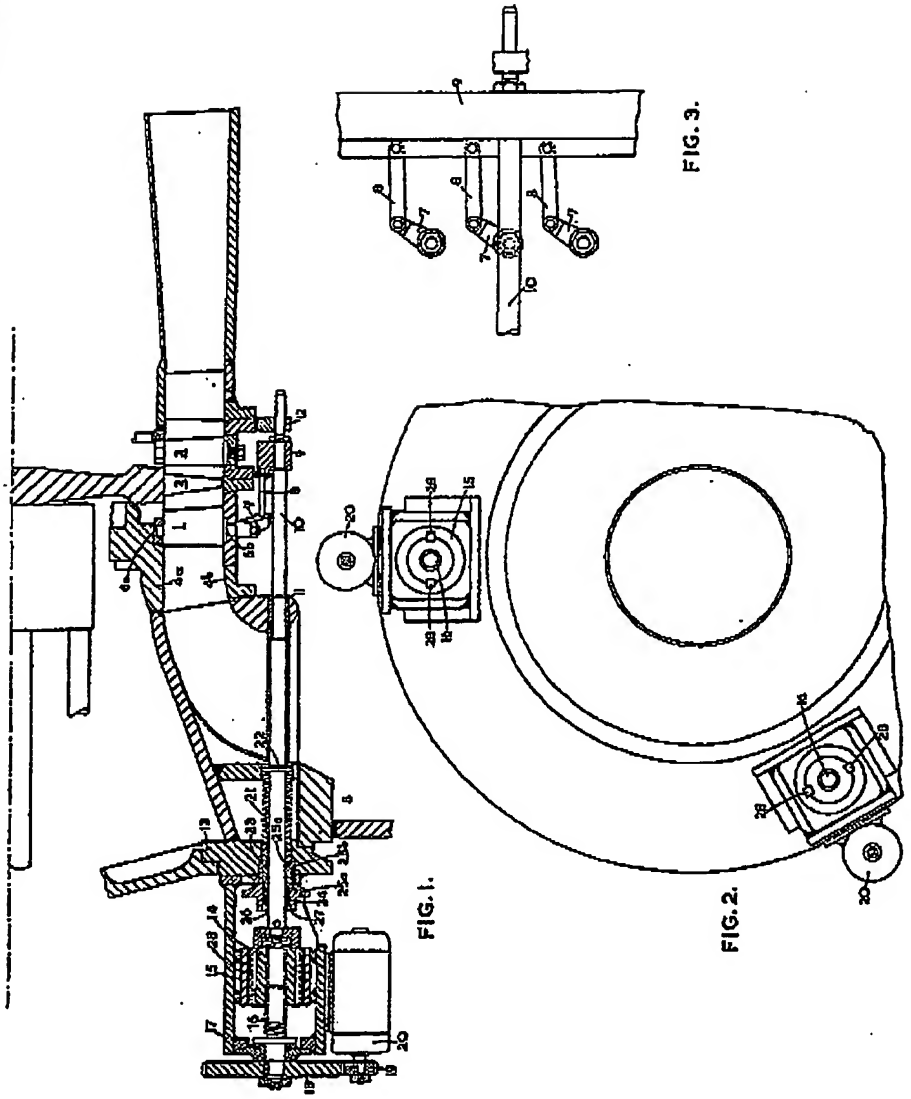

FIG. 1.

FIG. 2.

FIG. 3.